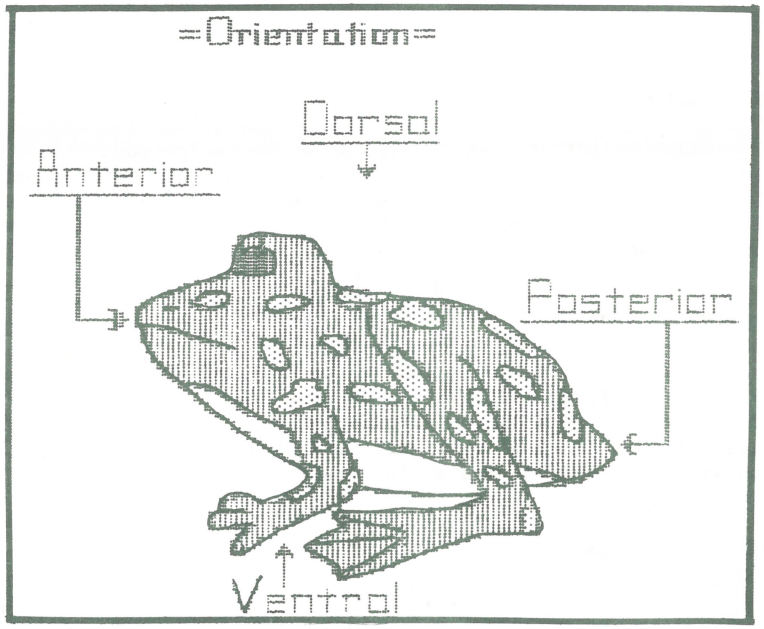
FROG DISSECTION



by: LARRY NEWBY

CROSS EDUCATIONAL SOFTWARE

FROG DISSECTION

Copyright 1984
Larry Newby

IBM Version 1988
Macintosh Version 1990
Copyright Mark Cross

INTRODUCTION

"FROG DISSECTION" can be used as a pre-lab or post-lab computer activity. It gives instructions and definitions that a student should know before entering the lab. After a dissection, the program can be used as a self-test or a makeup activity for an absent student.

GETTING STARTED

All you have to do is insert the disk and turn on the power (Apple or IBM), or double click on the frog icon (Macintosh). After a few seconds the screen will show the menu on the next page. A color monitor will help, but the pictures are fully compatible with black and white.

DISKS AND COPIES

The Apple disk is copy-protected. A second backup disk is included in the package. 3 1/2 inch Apple disks are available at no extra cost by special request.

The IBM version includes both large and small disk sizes.

The Macintosh version comes on one 3 1/2 inch disk.

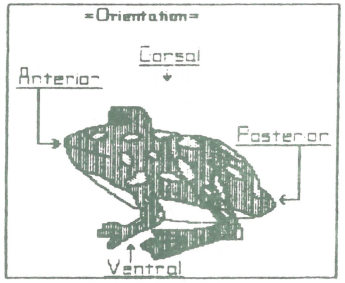
If the disk doesn't run when you receive it, it will be replaced free. Call the number on the disk jacket. If the disk fails after being used for 60 days, it is probably due to mishandling such as a fingerprint. After 30 days there is an $8 charge to replace a disk.

MANUAL

This manual is not copyrighted. In particular, the test pages can be duplicated and used as homework.

MENU

1) ORIENTATION
2) STRUCTURES AND FUNCTIONS
3) STUDENT CONTROLLED DISSECTION
4) SELF-TEST



INTRODUCTION

The following words will be used in the program. How many of them do you know?

ABDOMINAL	ANTERIOR
CLOACA	DORSAL
DUODENUM	ESOPHAGUS
EUSTACHIAN TUBE	EXTERNAL
FAT BODIES	GALL BLADDER
GLOTTIS	HEART
INCISION	INTERNAL
KIDNEY	LARGE INTESTINE
LATERAL	LIVER
LUNG	MAXILLARY TEETH
NARES	OVARIES
OVIDUCTS	PANCREAS
PECTORAL GIRDLE	POSTERIOR
REPRODUCTION	SMALL INTESTINE
SPLEEN	STOMACH
TESTES	URINARY BLADDER
VASCULAR	VENTRAL
VOMERINE TEETH	

STRUCTURES AND FUNCTIONS

MOUTH STRUCTURES

NARES--Internal/external openings that allow air into and out of mouth.

EUSTACHIAN TUBE--Connects "inner ear" to the inside of mouth. Equalizes pressure.

GLOTTIS--Opening that connects mouth to lungs.

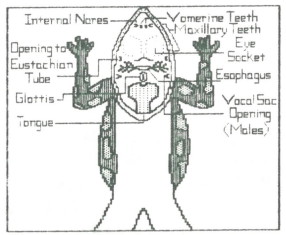
TONGUE--Attached at front of jaw. Very sticky. Used for catching food.

MAXILLARY TEETH--Tiny teeth used for holding prey so it cannot escape.

VOMERINE TEETH--Function not known.

ESOPHAGUS--Connects mouth to stomach.

VOCAL SAC OPENING--Is found in males. This opening allows air to be forced from mouth to vocal sac.



INTERNAL STRUCTURES

HEART--Three-chambered muscular organ. Circulates blood to body parts.

LIVER--Two main lobes/Produces bile/Stores glycogen (complex sugar).

STOMACH--Mixes food and mucus for easier movement/ Mechanically digests/Starts chemical digestion.

SMALL INTESTINE--Chemically digests all food types/ Absorbs food into body.

LUNG--Sac-like structure for oxygen/carbon dioxide exchange.

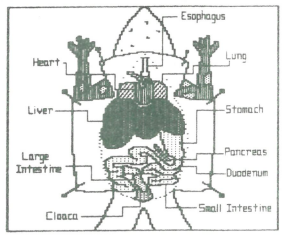
ESOPHAGUS--Carries food from mouth to stomach.

LARGE INTESTINE--Stores wastes for removal from body.

DUODENUM--First section of small intestine.

PANCREAS--Releases digestive enzymes into duodenum through bile duct.

CLOACA--Receives reproductive cells (eggs or sperm), digestive wastes and urine for release to outside.



We will now remove part of the liver, intestines, and stomach to reveal other major organs.

KIDNEY--Filters waste materials from the blood.

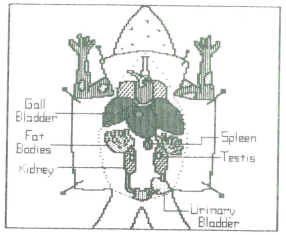
FAT BODIES--Stores energy, mainly for hibernation.

TESTES--Male reproductive organ.

URINARY BLADDER--Collects urine for removal from the body.

SPLEEN--Recycles worn out blood cells.

GALL BLADDER--Stores bile from the liver.



STUDENT CONTROLLED DISSECTION

The following dissection is intended to be used in conjunction with some type of biology or life science text or as a pre-dissection activity to familiarize the student with the guidelines of a general frog dissection.

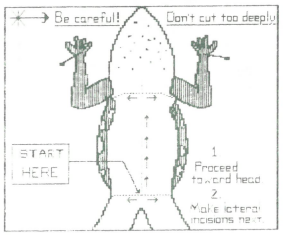
Through the use of various colors and patterns in the program, the student will quickly become familiar with the general structures found in the frog.

1) We shall start by placing the frog back (dorsal) side down. The stomach (ventral) side will be facing up in the dissecting tray.

2) The forelimbs may be pinned down to stop the specimen from sliding around on the dissecting tray while you are working.

3) Start the incision at the posterior (back) end of the frog and proceed toward the anterior (front) end.

4) Once the incision is completed to the lower chest area, go back and make the lateral incisions.



1) As the lateral incision are made at the posterior, the skin and abdominal wall can be pulled back.

2) Care should be taken when making the lateral cuts so as not to damage underlying organs.

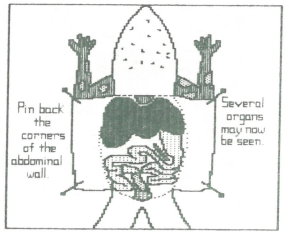
3) Continue the lateral cuts until the internal organs can easily be viewed.

1) The lateral incision at the anterior end of the frog should be made next.

2) There is a protective covering over the heart called the "pectoral girdle." This muscular layer is very difficult to cut through. Be careful! The heart lies directly below this covering.

3) The lateral incisions should be made just posterior to the pectoral girdle. This will make the cutting a bit easier.

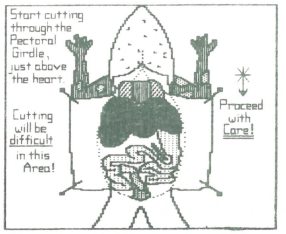
4) Once these incisions are finished, the abdominal wall may be pinned back.



1) Next cut through the pectoral girdle just over the heart and continue cutting toward the lower jaw. This incision should stop in the mid-throat area.

2) Because of the pectoral girdle, this will probably be the most difficult incision that will be made.

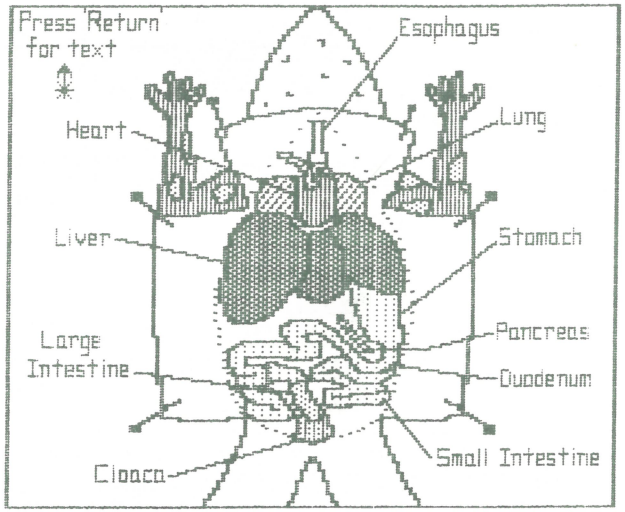
3) Again, be careful! This area is very muscular and hard to cut through. The heart is just below the pectoral girdle.


Start cutting through the Pectoral Girdle, just above the heart
Cutting will be difficult in this Area!
Proceed with Care!

1) Once the pectoral girdle is cut and the corners are pinned back, the internal organs may be seen.

2) In the picture you can see several of the most common organs.

3) In the following pages we will discuss each of the organs and their functions in the body of the frog.



GENERAL STRUCTURES AND FUNCTIONS

The heart of the frog is one of the primary parts of the circulatory system.

It is made up of three chambers. This includes two auricles and one ventricle.

Blood returning from the body (low in oxygen) enters the right auricle. Blood returning from the lungs (oxygen rich) enters the left auricle. Both auricles empty into the same ventricle. The blood is then pumped out, some returning to the lungs and some to the body.

The stomach of the frog is very similar to a man's stomach in structure and in function. Food is stored, mixed with mucus, and mechanically digested. Carbohydrates and proteins also are partly digested in the stomach.

The esophagus of the frog is a tube which connects the mouth to the stomach. It is lined with tiny hairs or cilia to help the movement of food.

The small intestine breaks down fats, carbohydrates, and proteins into simpler particles which can be absorbed into the body. The food is absorbed directly through the walls of the intestine. The first section of the small intestine is called the duodenum. This is where bile from the gall bladder and juices from the pancreas are introduced into the small intestines.

The pancreas secretes the enzymes so important to the digestion of many food types. These include proteins, fats, and carbohydrates. The pancreas is located near the bile duct which connects the gall bladder to the duodenum. It lies in an area between the stomach and small intestine.

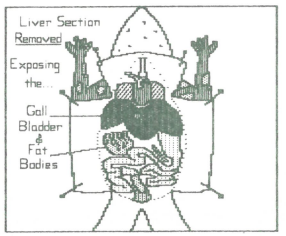
The large intestine and cloaca are at the end of the digestive tract. The large intestine serves as a storage area for digested food until it is removed from the body. The cloaca serves as a storage area for urine and sperm cells until they are also excreted from the body of the frog.

The lungs of the frog are used for oxygen/carbon dioxide exchange. The frog breathes with gills as a tadpole but develops lungs after reaching adulthood.

The lungs make the frog a true air breather although during periods of winter hibernation the frog does "breathe" through its skin. Because the frog does not have a diaphragm, it must force air into its lungs. This is accomplished by closing the nares (nostrils) and moving the throat area up. This "pumping" action forces the air down into the lungs. This can be observed by watching any frog. See how the throat area moves in and out.

The liver has two major lobes with a smaller lobe between them. The liver stores carbohydrates as glycogen for future use. During the summer months the liver is generally larger and lighter in color as food is being stored. In the winter it is generally smaller and darker. The liver is also responsible for the production of bile which is stored in the gall bladder. The gall bladder is greenish in color and is nestled between the lobes of the liver.

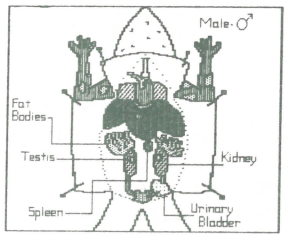
A section of the liver has been removed, so you are able to see the gall bladder mentioned earlier and one other part, the fat bodies.

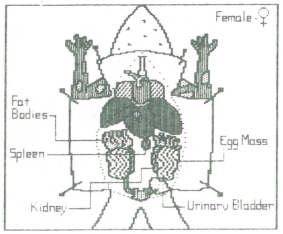


The fat bodies are found in front of the sex organs in the frog. They are made up of large, yellow, finger-like lobes. The fat bodies serve as a storehouse for energy. They increase in size during the summer preparing for the winter hibernation period or breeding season.

We shall now look at some of the distinctinve parts of the male and female frog. As you will see, they have some parts in common, such as fat bodies and the spleen. Other parts like the testes and oviducts are found only in the male and female, respectively.

The kidneys of the frog consist of thousands of tiny tubules which filter water and wastes, such as urine, from the blood. The two kidneys of the frog are dark red and are imbedded in the back wall of the body cavity on either side of the backbone. As the water or urine is filtered from the blood, it passes into a duct (which in the male also carries the sperm from the testes) and empties into the cloaca. The testes (testis-singular) is the primary sex organ in the male frog. They are whitish rounded organs found lying against the kidneys. They are attached by a thin membrane to the inside of the body wall. The testes are responsible for the production of sperm cells.





The spleen is found in both the male and the female. It is an organ that is located near the intestine and stomach. The spleen is a highly vascular organ that is involved with destroying worn out blood cells and recycling them. It also is involved in blood storage and the production of lymphocytes. Another organ found both in the male and female is the urinary bladder. It is a two-lobed "pouch" that stores urine before final elimination through the cloaca.

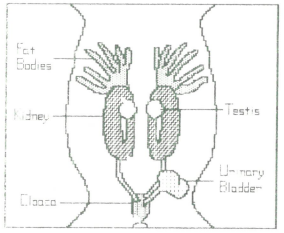
The ovaries/oviducts are the female reproductive organs. The ovaries lie against the dorsal side of the body cavity. Prior to the breeding season, they swell until they fill much of the body cavity. During the breeding season the hundreds of eggs which have matured burst from the ovaries and fill the body cavity. They are eventually squeezed from the female by the male. They pass through the oviducts, into the cloaca, and out of the body, where the male will fertilize them.

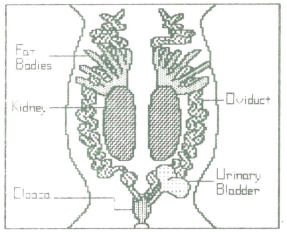
You may find oviducts in the male frog. These are called "vestigial oviducts." They serve no useful function in the male frog.

Press F to see female close-up.

Press M to see male close-up.

Press ==> to go on.





PARTS IDENTIFICATION

In this test you will first see a picture of a dissected frog. You will then be asked to identify the internal organs shown in the picture.

1) The letter for the LIVER is ___.

2) The letter for the CLOACA is ___.

3) The letter for the GALL BLADDER is ___.

4) The letter for the SMALL INTESTINE is ___.

5) The letter for the LUNG is ___.

6) The letter for the ESOPHAGUS is ___.

7) The letter for the PANCREAS is ___.

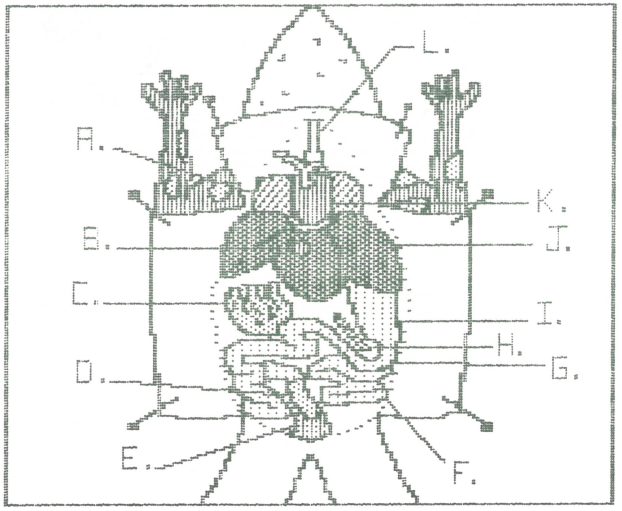
8) The letter for the STOMACH is ___.

9) The letter for the LARGE INTESTINE is ___.

10) The letter for the DUODENUM is ___.

11) The letter for the HEART is ___.

12) The letter for the FAT BODIES is ___.



TEST ON FUNCTIONS OF PARTS

MULTIPLE CHOICE

1) The CLOACA in the frog:

A) receives wastes.
B) receives eggs.
C) receives sperm.
D) All of the above.

2) The LIVER in the frog:

A) stores bile.
B) stores glycogen.
C) stores wastes.
D) helps the esophagus.

3) The SMALL INTESTINE:

A) connects the ESOPHAGUS.
B) disposes of waste materials.
C) absorbs food particles.
D) All of the above.

4) The KIDNEYS of the frog:

A) filter the blood.
B) absorb food particles.
C) produce digestive juices.
D) produce enzymes.

5) What stores energy for future needs?

A) the STOMACH
B) the SMALL INTESTINE
C) the FAT BODIES
D) the DUODENUM

6) Which of the following stores wastes?

A) the URINARY BLADDER
B) the LARGE INTESTINE
C) the CLOACA
D) All of the above.

7) The TESTES of the frog:

A) aid in digestion.
B) store waste products.
C) absorb oxygen.
D) are found in male frogs only.

8) The SPLEEN:

A) recycles old blood cells.
B) mechanically digests food.
C) chemically digests food.
D) absorbs food particles.

9) The PANCREAS of the frog:

A) empties into the STOMACH.
B) empties into the URINARY BLADDER.
C) empties into the KIDNEYS.
D) empties into the SMALL INTESTINE.

10) The DUODENUM is:

A) part of the STOMACH.
B) part of the SMALL INTESTINE.
C) a storage area for food.
D) connected to the KIDNEYS.

TEST ON FUNCTIONS OF PARTS

TRUE/FALSE #1

T F 1) The frog's heart is 4-chambered.

T F 2) The liver produces bile.

T F 3) The stomach chemically digests food.

T F 4) The small intestine joins the stomach and the large intestine.

T F 5) The frog breathes with lungs.

T F 6) The esophagus starts digestion.

T F 7) The reproductive cells are stored in the large intestine.

T F 8) The duodenum is the first section of the large intestine.

T F 9) The pancreas is the reproductive organ in the male frog.

T F 10) The cloaca absorbs food particles.

TRUE/FALSE #2

T F 1) The frog's heart is 3-chambered.

T F 2) The liver stores bile.

T F 3) The stomach starts and ends digestion.

T F 4) The small intestine digests all foods.

T F 5) The frog has one lung.

T F 6) The esophagus carries blood to the body.

T F 7) Waste materials are stored in the large intestine.

T F 8) The duodenum is another name for the stomach.

T F 9) The pancreas aids in digestion.

T F 10) The cloaca is the first part of the small intestine.

TRUE/FALSE #3

T F 1) The frog's heart is 2-chambered.

T F 2) The liver stores glycogen.

T F 3) The stomach physically digests food.

T F 4) The small intestine digests only fats.

T F 5) The frog breathes with gills.

T F 6) The esophagus connects the mouth to the stomach.

T F 7) The large intestine is joined to the stomach.

T F 8) The duodenum is the first section of the small intestine.

T F 9) The pancreas releases digestive enzymes.

T F 10) The cloaca receives materials to be released to the outside.